

WHAT IS CLAIMED IS:

1. A semiconductor device comprising:
 - a first electrode film;
 - a second electrode film opposing the first
 - 5 electrode film;
 - a capacitor insulating film provided between the first electrode film and the second electrode film;
 - a first connection part electrically connected to the first electrode film;
 - 10 a second connection part electrically connected to the second electrode film;
 - a first wiring electrically connected to the first electrode film by the first connection part;
 - a second wiring electrically connected to the
 - 15 second electrode film by the second connection part;
 - and
 - a protective insulating film provided between the capacitor insulating film and the second electrode film or on the second electrode film;
 - 20
2. A semiconductor device according to claim 1, wherein the protective insulating film has relative dielectric constant ϵ of at least 10.
3. A semiconductor device according to claim 1, wherein $10 \leq \epsilon \leq 30$, where ϵ is relative dielectric
- 25 constant of the protective insulating film.
4. A semiconductor device according to claim 1, wherein $10 \text{ nm} \leq X \leq 20 \text{ nm}$, where X is a thickness of

the protective insulating film.

5 5. A semiconductor device according to claim 1,
wherein the protective insulating film has a thickness
X that ranges from 10% to 40% of the thickness of the
capacitor insulating film.

6. A semiconductor device according to claim 1,
wherein the capacitor insulating film is a tantalum
oxide film.

10 7. A semiconductor device according to claim 1,
wherein the protective insulating film is an aluminum
oxide film.

8. A semiconductor device according to claim 1,
further comprising a diffusion-preventing film provided
below the first electrode film.

15 9. A semiconductor device according to claim 1,
wherein the first wiring and the second wiring are
formed of copper.

20 10. A semiconductor device according to claim 1,
wherein the first connection part and the second
connection part are formed of copper or tungsten.

25 11. A method of manufacturing a semiconductor
device comprising a capacitor which has a first
electrode film, a second electrode film, and a
capacitor insulating film provided between the first
and second electrode films, said method comprising:

forming a protective insulating film between the
capacitor insulating film and the second electrode film

or on the second electrode film;

forming a insulating film on the capacitor;

forming a first trench configured to expose a part
of the first electrode film, and a second trench

5 configured to expose a part of the second electrode
film;

performing heat treatment which uses a hydrogen-
containing gas; and

forming in the first trench a first connection
10 part electrically connected to the first electrode, and
forming in the second trench a second connection part
electrically connected to the second electrode film.

12. A method according to claim 11, further
comprising:

15 forming a first wiring trench and a second wiring
trench before the heat treatment is performed, said
first and second wiring trenches continuing with the
first and second trenches, respectively; and

forming a first wiring and a second wiring in the
20 first and second wiring trenches, respectively, at the
same time the first and second connection parts are
formed.

13. A method according to claim 11, wherein, the
protective insulating film has relative dielectric
25 constant ϵ of at least 10.

14. A method according to claim 11, wherein
 $10 \leq \epsilon \leq 30$, where ϵ is relative dielectric constant of

the protective insulating film.

15. A method according to claim 11, wherein
10 nm \leq X \leq 20 nm, where X is a thickness of the
protective insulating film.

5 16. A method according to claim 11, wherein the
protective insulating film has a thickness X that
ranges from 10% to 40% of the thickness of the
capacitor insulating film.

10 17. A method according to claim 11, wherein the
capacitor insulating film is a tantalum oxide film.

18. A method according to claim 11, wherein the
protective insulating film is an aluminum oxide film.

19. A method according to claim 11, wherein the
capacitor is formed on a diffusion-preventing film.

15 20. A semiconductor device according to claim 12,
wherein the first wiring and the second wiring are
formed of copper.

20 21. A method according to claim 11, wherein the
first connection part and the second connection part
are formed of copper or tungsten.